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Fishbone Quality Control Tool for Enhancing Effective Building Project Delivery in Bayelsa State, Nigeria

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ABSTRACT

This study is on fish bone quality control tool for enhancing effective building project delivery in Bayelsa State, with the aim of determining whether the use of fish bone as a quality control tool enhances effective building project delivery in Bayelsa State. The population for the study was 188, consisting of 83 building professional lectures in tertiary institutions and 105 building professionals in ministries, departments and authorities in Bayelsa State. The study adopted analytical descriptive survey design. Questionnaire was used to collect needed data from the respondents, using 4-point Likert rating scale. Cronbach Alpha method was used for testing the reliability of the instrument and reliability coefficient of 0.79 was obtained. The research question was answered using the mean and standard deviation while t-test statistics was used to test the null-hypothesis at 0.05 level of significance. Finding revealed that fishbone as quality control tool enhances effective building project delivery in Bayelsa State. Result obtained showed that there was no significant difference in the mean response score of both building professional lecturers in tertiary institutions and building professionals in ministries, departments and authorities on fishbone as a quality control tool for enhancing effective building project delivery in Bayelsa State. Therefore, it was concluded that fishbone is a quality control tool for effective building project delivery. Based on the findings, it was recommended that building construction professionals be encouraged to adopt and implement the use of fishbone diagram as a quality control tool for enhancing effective project delivery in Bayelsa State.

Keywords: Construction, Building, Professionals, Quality Control, Fishbone Diagram

INTRODUCTION

Construction as a concept refers to the art, manner and process of designing, maintaining and developing the natural and physical built environment. It entails the designing of a structure as well as the bringing together of necessary requirements for the building of that structure. It involves the installation and assembling of various project activities on site in accordance with approved designs, methods and specifications. [1] The construction industry plays a critical role in the development and maintenance of infrastructure, buildings,

and facilities that are essential for societies to function and thrive. Since construction projects are very complex in nature, it makes the industry susceptible to disputes, delays and lost related issues. [1]

The construction industry has significant responsibilities in ensuring the development of essential infrastructure and buildings, while also contributing to economic growth, urban development, and the well-being of communities. According to, [2] a socially responsible construction company closes the cycles of construction materials, gives value to waste generated, minimizes the impacts that buildings have on the environment, makes responsible use of energy and water, uses innovations to improve the process and adequately manage its human resources. That is why it is paramount to put in place measures to control the construction process.

Nigeria as a country is the most populated black nation in the world with about 200 million people. [3] Regardless of the vast human capital, national resources and economic potentials, Nigeria is still plagued with numerous socio-economical and developmental problems; and building is among the major challenges facing Nigeria as a country. [4]

Building can be defined as the provision of living accommodations for individuals and families. It includes a wide range of residential structures, from single-family homes and apartments to dormitories and other group housing options. Housing also encompasses the social and economic aspects of community, including the location of the residence and the surrounding neighbourhood. In this regard, a building is an environmental envelope that creates a comfortable interior environment by altering the exterior or natural. [5]

Building is a fundamental aspect of human society, with a rich history and a wide range of social, economic, and policy consideration. According to, [6] building is one of the most important life components giving shelter, safety and warmth, as well as providing a place to rest. The provision of safe, affordable, and suitable building is a key priority for governments and communities around the globe and the future of building will continue to be shaped by ongoing social and economic development. Housing plays critical role in the well-being of mankind. Every rational human being looks for a place to live in other to carry out day to day activities. It is very important in the economic development of any country. According to [7] building in the construction sector matters a lot to the economic development as it enhances economic performance. In the 20th century, governments around the world began to recognize the importance of building as a basic human need, and building policies and formations were implemented to ensure safe and affordable building for all. The concept of public building emerged, with government-subsidized building developments providing affordable options for lower-income individuals and families.

Quality is the standard of excellence or superiority in goods and services, defined by the degree to which a product or service meets or exceeds customer expectations and requirements. It includes aspects such as reliability performance, durability, and customer satisfaction. Quality in building construction projects refers to the standard of workmanship, materials, and overall outcome of the project. It encompasses all aspect of the construction process, from design and planning to the actual construction and completion. Quality is a critical factor in ensuring that the building meets the necessary standard.

Quality in project construction is one aspect in the construction industry that is very important. It is one of the most important elements in determining the success of construction projects and how closely a project work may adhere to established standards and specifications. [8] The degree to which an item or entity (such as costs, goods, or services) meets a predetermined set of characteristics or specifications is another way to define quality. [9] A

construction project's capacity to maintain standards for performance, grade, durability, appearance, and intended purpose is referred to as its quality. The safety of employees, residents, and the general public is guaranteed by high-quality building construction projects. Poor building quality can result in mishaps, injuries, or even fatalities. Long-term time and cost savings are achieved by reducing the frequency of maintenance and repair actions required by high-quality building projects. Another important factor that professional construction work offers and raises the project's value is customer satisfaction. In an effort to improve the quality of construction projects, it is important to use quality control measures to ensure high-quality building projects and minimize subpar projects in the built environment. [1]

Quality control is a process that is used to ensure that a product or service meets specific quality standards and requirements. It involves monitoring and testing a product or service at various stages of its production or delivery to ensure that it meets the desired level of quality. It is an essential aspect of Building production process to ensure customer satisfaction and compliance with industry regulations. As a concept, quality control includes activities that help to provide desired results during the construction phase. Quality control is the process of tracking project activities to ensure compliance with regulatory bodies' standards and specifications, as well as reducing poor performance and cost requirements during project construction. [10] According to [11] quality control is the primary activity and technique used in the construction process to meet the requirements for quality. The construction industries use quality control to ensure that the quality of project work is sustained or enhanced. The goal of a quality control system is to ensure that the final product of the project work meets the standards and guidelines established by regulatory bodies. In the building construction industry, the approach aids in expediting the quality improvement of goods and services. [12] In order to make sure that flaws are found and fixed during the construction process, processes for quality control in the construction industry include inspecting building materials and equipment, evaluating construction methods and techniques, and keeping an eye on the workmanship of workers on construction sites. During project work, quality control aims to meet client needs while also producing high-quality, long-lasting goods that adhere to industry standards for the construction sector. Adopting quality control procedures or tools is essential for successful project delivery, [13] as they are useful for increasing output, successfully removing errors, and providing information about the phases to clients. Additionally, they play a critical role in guaranteeing client pleasure, safety, cost effectiveness, durability, and regulatory compliance. In this regard, [14] reported that Quality control implementation allows companies to offer a higher quality product, which has positive influence on customer satisfaction.

Fish bone diagrams are also called cause and effects diagrams or Ishikawa diagrams. [15] They are used as quality control measures in the construction industry. These diagrams are formulated to identity challenges. These charts look like the bones of a fish which has various branches. Each of the branches of the diagram becomes an aspect of the problem to be explored and analysed. The head of the fish is the quality problem. The charts are presented in a manner that the spine of the fish connects the head to the possible cause of the problem in the construction process. Fish bone diagram is a graphic method of finding out factors affecting the characteristic of work output quality. [16] According to [15] the head of fish is observed as the effect and the body in the form of bones illustrates the cause of known problem. In the same vein, the fish bone diagram helps to explained in detail the reasons for any variability or dispersion during project construction. [10] These charts focus on symptoms of problem

which becomes the root causes of a challenge in the construction process by identifying them and making alternative action to resolving the problem by gathering and formulating the possible causes, reaching a common understanding of the problem and bridging the gaps. [17] Fish bone diagrams are used for analysing and exploring relationship between a cause and effect of a challenge. The problem or effect is place at the head of the diagram then the cause and effect are critically investigated. The tool is designed to generate advancement concept of a product quality during production process. The tool aids users in the gathering and organizing of ideas and possible cause of an effect in understanding the problem and analysing gaps that are known. [17] During the project construction process various issues pertaining to quality can arise, such as defects due to structural challenges, problem of defective workmanship, inconsistencies in design, substandard materials problems etc. Fish bone diagram can be helpful in identifying the possible root causes of these challenges in a systematic manner by categorizing them into groups. These identified groups can be further analyzed holistically by sub-dividing them in other to analyze the root causes of the problem during the construction. Once the root causes of quality matters are being identified with help of fish bone diagram, then the project team can put in place measures to address them. Fish bone diagram is a valuable quality control tool in the construction industry as it helps in collaboration and support the continuous improvement of quality among construction professionals for effective building project delivery in the building construction industry.

Building projects in Bayelsa State, Nigeria, are often plagued by delays, cost overruns, and poor quality, resulting in significant economic losses and stakeholder dissatisfaction. Despite the importance of quality control in ensuring successful project delivery, many building projects in the state fail to meet desired standards due to inadequate quality management practices. The lack of effective quality control tools and techniques exacerbates these issues, leading to rework, defects, and decreased client satisfaction. This study aims to investigate the application of the fishbone diagram (Ishikawa diagram) as a quality control tool to identify and mitigate the root causes of quality-related issues in building projects in Bayelsa State, with the ultimate goal of improving project delivery outcomes.

This therefore, predisposes a study to investigate fishbone quality control tool for enhancing effective building project delivery in Bayelsa State with the objective to determining whether the use of fishbone quality control tool enhances effective building project delivery in Bayelsa State.

MATERIALS & METHODS

The study adopted analytical descriptive survey design.

The population of the study comprised 188 building construction professional lecturers in tertiary institutions of learning and building construction professionals in ministries, department, and authorities. The population of the study comprised 105 building construction professionals in Bayelsa State ministries, department and authorities and 83 building construction professional lecturers in tertiary institutions in Bayelsa State respectively. The study therefore adopted census survey. Structured questionnaires were used to obtain data from the respondents. The response options on a 4-points Likert rating scale were strongly agree (SA), agree (A); disagree (D), and strongly disagree (SD). A total of 188 copies of questionnaires were administered with the help of two Research Assistants to the respondents in Niger Delta University, Federal University, Otuoke, Bayelsa State Ministry of Land, Housing and Urban Development, Bayelsa State Ministry of Works and Infrastructure and Bayelsa State Physical Planning and Development Board. Mean and standard

deviation were used to analyze the collected data. A mean response score of 2.50 was used as the criteria score on a 4-point rating scale for decision making. Thus, a questionnaire item with a mean response score equal to and above 2.50 was considered high perception and a questionnaire item with a mean perception score below 2.50 was considered low perception.

STATISTICAL ANALYSIS

The null hypotheses were tested using t-test of two independent variables at 0.05 level of significance. Thus; if t- calculated value is greater than t-critical value, the null hypothesis of no significant was rejected but if the t- calculated value is less than t-critical value, the null hypothesis of no significant was accepted.

RESULT

Mean Response

The results in Table 1 indicated that the mean response scores of building construction professional lecturers in tertiary institutions and building construction professionals in ministries, departments and authorities respectively on fish bone diagram as a quality tool for enhancing effective building project delivery in Bayelsa State, were 3.29, 3.28, 3.25, 3.27, 3.23, and 3.24 for building construction professional lecturers in tertiary institutions and 3.48, 3.44, 3.27, 3.39, 3.28 and 3.19 for building construction professionals in ministries, departments and authorities respectively in Bayelsa State.

Table 1: Mean response scores on fish bone as a quality control tool for effective building project delivery in Bayelsa State.

S/N	Item Statement	Building Professional Lecturers (BPL)				Building Professionals in MDA			
	Fish Bone as a quality control tool enhances effective building delivery by helping in;	Total N	X1	SD 1	Remark	Total N	X2	SD 2	Remark
1	The identification of construction Quality issues	83	3.29	0.68	Agreed	105	3.48	0.72	Agreed
2	Analyzing the root causes of problems In Construction process.	83	3.28	0.69	Agreed	105	3.44	0.67	Agreed
3	Problem solving and continuous Improvement of construction process	83	3.25	0.67	Agreed	105	3.27	0.72	Agreed
4	Construction risk management.	83	3.27	0.66	Agreed	105	3.39	0.55	Agreed
5	Improving stakeholders' understanding of construction process	83	3.23	0.69	Agreed	105	3.28	0.68	Agreed
6	Cross-functional collaboration.	83	3.24	0.72	Agreed	105	3.19	0.83	Agreed
Grand mean and Standard Deviation			3.26	0.62	Agreed		3.34	0.70	Agreed

X = mean, SD = standard Deviation, BPL=Building Professional Lecturers, MDA= Ministry Department and Authorities, Criterion mean score =2.50.

Hypothesis Test

H01: There is no significant difference in the mean response scores of building construction professionals in tertiary Institutions and building construction professionals in Ministries, departments and authorities respectively on for fish bone diagram as a quality control tool for enhancing effective building project delivery in Bayelsa State.

Table 2: t-test analysis of significant difference between the mean response score of building construction professional lecturers in tertiary institution and building construction professionals in ministries, departments and authorities on fish bone diagram as quality control tool enhance effective building project delivery in Bayelsa State.

Respondents	N	X	SD	DF	Level of Significance	t-cal	t-critical	Decision
Building Professional Lecturer	83	3.26	0.62	186	0.05	0.82	2.00	HO_1 Accepted No Significant Difference
Building Professional in Ministries, Departments and Authorities	105	3.34	0.70					

The result in Table 2 revealed that the calculated t-value of 0.82 was less than the critical t-value of 2.00 at 0.05 probability level with 186 degree of freedom. Thus, the null-hypothesis was therefore accepted. This implied that there was no significant difference in the mean response scores of building construction professional lecturers in tertiary institutions and building construction professionals in ministries, departments and authorities respectively on fish bone diagram as quality control tool for enhancing effective building project delivery in Bayelsa State. That is, it was accepted by the two groups of building construction professionals that fish bone diagram as a quality control tool enhances effective building project delivery in Bayelsa State. In addition, the standard deviation result of 0.62 and 0.70 for both building construction professional lecturers in tertiary institutions and building construction professionals in ministries, departments and authorities were close, indicating homogeneity in the results.

DISCUSSION

The mean response scores of the two groups of building construction professionals were above the mean criterion response score of 2.50, which indicated that, the two groups of building construction professionals agreed that all the item statements for fish bone diagram were quality control tool for enhancing effective building project delivery in Bayelsa State. Also, the grand mean response scores of 3.26 and 3.34 for building constructing professional lecturers in tertiary institution and building construction professionals in ministries, departments and authorities respectively was also above the criterion score of 2.50. This means that, fish bone diagram as a quality control tool enhances effective building project delivery in Bayelsa State.

Moreover, from the test of hypothesis, that there was no significant difference in the mean response scores of building construction professional lecturers in tertiary institutions and building construction professionals in ministries, departments and authorities respectively on fish bone diagram as quality control tool for enhancing effective building project delivery in Bayelsa State. This finding is consistent with the study of [18] who reported that fish bone diagram analysis as an effective tool in identifying construction quality issues and analyze root causes of problems with construction process.

CONCLUSION

Findings from the study showed that building construction professional lecturers in tertiary institutions and building construction professionals in ministries, department and authority responded that fishbone diagram is a quality control tool for enhancing effective building project delivery in Bayelsa State.

Declaration by Authors

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